

META-ANALYSIS OF EXCESS MORTALITY DURING HEAT WAVES AND COLD SPELLS IN FOUR CITIES IN RUSSIAN SUBARCTIC REGION

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Background and Aims: Circumpolar region presents particular interest for epidemiologists because it will experience the greatest climatic changes. Epidemiological study in a small town is difficult for a statistician because the daily mortality counts are small; they are not normally distributed and do not fit the independence assumption. We accounted for these difficulties and assessed the impacts of extreme temperature events on mortality rates in four sites within Russian subarctic region: Archangelsk, Murmansk, Yakutsk and Magadan), and then conducted a meta-analysis.

Methods: Long-term distributions of daily mean temperatures were analyzed for identification of heat waves and cold spells during the study period of 1999-2007 at each location. We investigated daily mortality from all non-accidental causes, coronary heart disease, strokes, respiratory diseases and all external causes among age groups 30-64 and 65+. Statistical analysis was done in two steps. In Step 1, site-specific estimates of relative increases in mortality were obtained. At each location, separately estimated mortality risks for 'short' waves (5 to 7 days) and 'long' waves (8 days and longer). During Step 2, we obtained pooled estimates of cause- and age-specific mortality risks, and conducted meta-analysis of all site-specific information.

Results: The relationship between cold and mortality is stronger than between heat and mortality. Greater increases in mortality were observed during long cold waves than during short cold waves, but for heat waves the opposite was true. Age group 65+ was more vulnerable to cold than age group 30-64; but no age-specific differences were observed during heat waves. All increase in non-accidental mortality during cold waves was attributed to cardiovascular causes. Relative increases in mortality from all external causes during heat waves were commensurable with these from brain strokes. The proposed methodology can give fairly robust results only in towns with populations greater than approximately 100,000.